Chapter 16
A New Quantum Theory in Accordance with Islamic Science

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Abstract Wave-particle duality is one of the many strange phenomena observed in the quantum world that desperately requires a new theory. Such a theory is proposed herein through a metaphysical approach based on the Qur'an and the principles of Islamic science, supplemented by philosophical rational arguments. Interpreting relevant Qur'anic verses, together with the pairing concept and the one-to-one correspondence principle, manages to facilitate some detailed explanations regarding the wave-particle duality of an electron. Scientific analysis indicates an electron can consist of both a unit electrical charge and a permanent magnet, which all reflects on its wave-particle duality behaviour as per experimental observations. Though physicists are currently only considering the existence of the induced magnetic field, the presence of which is due to the spin of the electron, the new theory postulates that a permanent magnetic field is additionally present. Furthermore, the electrical charge and the permanent magnetism could be considered as potential energy, which is also believed to be possibly the zero point energy that has been observed to exist, but has yet to be properly explained. Based on this new theory, a mathematical equation has been derived to calculate the postulated potential energy of an electron. Islamic science in this case appears to have demonstrated its significance in proposing a new perspective in the exploration of the mysterious quantum world.

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16.1 Introduction

The quantum world consists of the smallest particles ever discovered experimentally – the atom and its subatomic particles – which cannot be seen and are considered by some contemporary Muslim scholars (ISTAC 2010) as a 'bridge' connecting our physical world to the spiritual one. The atom is unique and becomes the building block of everything in the universe, both animate and inanimate. In the hierarchy of physical sciences, quantum physics is located at the lowest end, acting as the foundation for the others and thus marking its paramount role in the sciences.

One of the many strange phenomena observed in the quantum world is wave-particle duality, which is the key to the development of quantum mechanics. Photons and electrons, for instance, are observed in double-slit experiments to behave sometimes like a wave and sometimes like a particle, but no acceptable theoretical explanation for this activity has been given (Wooters and Zurek 1979; Dürr and Rempe 2000; Afshar et al. 2007).

Since quantum mechanics deals with the 'unseen' realm (Eddington 1929; Capra 1975; Stap 2009; Marin 2009) and due to the complex nature of the problems it poses for researchers, the metaphysical method based on Qur'anic verses and relevant Islamic scientific principles, supported by philosophical rational arguments, is extensively used in this study. Relevant findings derived using the empirical method are also integrated in the analysis.

16.2 Islamic Scientific Principles

In Islamic science, the fundamental principles of the Qur'an and the particulars examined in nature are intelligently integrated and analysed. Many verses in the Qur'an contain important information about the creation of the universe and everything in it. Even though various versions of Islamic science are currently being promoted, the idea and concept introduced by Seyyed Hossein Nasr and Osman Bakar are of primary concern here (Bakar 2008; Nasr 1978).

Five important Islamic science principles have been identified by Osman Bakar (ISTAC 2010):

a) Unity of the cosmic laws
b) Signs (*āyāt)* and the symbolic significance of nature
c) One-to-one correspondence
d) Pairing concept
e) Causality principle (cause and effect)

From the above principles, the pairing concept and one-to-one correspondence have been applied in this analysis and are briefly explained below.

16.2.1 One-to-One Correspondence

The Qur'an states:

> In time We shall make them fully understand Our **messages in the utmost horizons** and **within themselves**, so that it will become clear unto them that this is indeed the truth. (*Fussilat* 41:53)

The verse mentions about the phenomena discovered in the earth's atmosphere and outer space that are messages or signs from God as the Creator.

16.2.2 Pairing Concept

There are two verses that specifically mention the pairing concept:

> And **all things** We have created in pairs, so that you may reflect (*al-Dhariyat* 51:49)

> Limitless in His glory is He who has created **in pairs** in whatever the **earth produces**, and in **men's own selves**, and **other things** which [as yet] they have no knowledge. (*Ya Sin* 36:36)

Verse (51:49) clearly states that all things are created in pairs, whilst verse (36:36) implies that there exist phenomena not known at the time of the Qur'anic revelation; these phenomena could well include such things as atoms and subatomic particles.

16.3 Qur'anic Scientific Analysis

Al-Qur'an is well known as a divine scripture that contains much scientific knowledge (Juoro 2011; Bucaille 2003; Ilyas 2001). These sacred verses are mostly allegorical (*mutashabihāt*); thus, one intuitively requires a deep insight of relevant scientific knowledge in order to extract their inner meanings. As mentioned in the verse (3:7), only God knows for certain the true meanings of these allegorical verses, but Muslims have an obligation to provide their best efforts of expert opinion or judgement *(ijtihād)* to unveil the scientific knowledge hidden in the Qur'an for the benefit of mankind (Husaini 1999).

Relevant verses as translated by Yusuf Ali (1968) are here analysed and philosophically discussed on certain paramount topics related to the quantum world. These cover the mass and energy created inside the three elementary particles of an atom, namely, electron, proton and neutron, as revealed in the three verses, which are believed to refer to the atom. The verse of light is specially mentioned and highlighted in the discussion because both electron and photon contribute to the phenomena of light.

16.3.1 Verses About the Atom

Three verses in the Qur'an are believed to mention the atom, and it is believed to reflect on the existence of certain elementary features within it. These verses can be analysed and interpreted scientifically to extract some relevant information that could contribute to the exploration of the quantum world.

> In whatever business thou mayest be, and whatever portion thou mayest be reciting from the Qur'an, and whatever work you may be doing, We are witnesses thereof when you are deeply engrossed therein. Nor is *hidden* from thy Lord the *weight* of an *atom* on the earth or in heaven. And not the least and not the greatest of these things, but (they) are recorded in a clear record. (*Yunus* 10:61)

> Say: Call upon other (gods) whom you fancy, besides Allah. They have no *power*, – not the *weight* of an *atom*, in the heavens or on earth. No share have they therein, nor is any of them a helper to Allah. (*Saba'* 34:22)

> Verily, Allah does not wrong by as much as an *atom's weight*: If there is any good (done), He will *double* it, and will bestow out of His grace a great reward. (*An-Nisa'* 4:40)

All three verses use the word 'weight' when mentioning the atom. However, weight is closely related to mass, in which the weight of a body is a force given by its mass multiplied by its acceleration (weight = mass × acceleration). Therefore, the verses provide an indication that the mass is the most fundamental property of an atom. When we refer to the well-established Einstein's equation in which the energy $E = mc^2$ wherein m is the mass and c is the speed of light, the equation asserts that the mass of an atom is profoundly related to its energy. According to Baierlein (2007), Einstein's (1907) major conclusion is that the mass is a measure of its energy content. Einstein (1949) asserted, 'The laws of the conservation of momentum and the conservation of energy are merged into a single law. The inertial mass of a closed system is identical with its energy, so that inertial mass is eliminated as an independent concept'.

Also, energy manifested in the form of mass can be considered as the most basic aspect of an atom, as implied in the verses and verified by Einstein's equation. Nonetheless, physicists presently are unable to explain for certain in detail how the mass of a body is related to its energy, meaning what kind of energy creates the mass and how it is created.

There are presently two different views proposed by physicists to explain this important issue of the origin of mass: (a) the Higgs mechanism and (b) chiral symmetry breaking of quantum chromodynamics. But both proposals, especially the Higgs mechanism and its associated conceptual problem, are still being extensively debated by both physicists (Witten 2007; 't Hooft 2005; Wilczek 2000, 2003) and philosophers of science (Friederich et al. 2014; Wüthrich 2010; Lyre 2008, 2010; Smeenk 2006; Brading and Castellani 2003; Kosso 2000). It is the intention of this study to provide an alternative novel idea as an explanation to this fundamental question.

The Qur'anic verse (34:22) mentions the word 'power', which is closely related to energy whereby power is the rate at which energy is expended. Allah is the only God that exists and His Power is manifested in the atoms that are found throughout the universe. The energy and power hidden in the atom are so immense, as proven by their manipulation to produce nuclear energy, which is created from the nucleus, whilst the generation of light energy derives from the electron. Al-Ghazali asserted that power and will should be present in the individual atom (Al Ghazali 2010), probably based on an interpretation of this verse.

In verse (4:40) God again reminds us about the good deeds, which will be rewarded double. But the amount of this reward has been mentioned in various verses in different ways. For example, in verse (6:160) the good deeds are said to be reimbursed ten times. In the verse about the atom, the reward is specifically mentioned to be doubled. This could be a hint about the property of an atom or its constituents that relate to the word 'double'. The word 'double' could also mean pairing. In the study of the phenomena observed in the quantum world, the important key is the wave-particle duality of its subatomic particles. Electrons and photons are observed to behave both as particles and as waves. The author believes that the verse specifically mentions the word 'double' to provide an indication about the existence of two types of energy that relate to this behaviour. In compliance with the pairing concept, the two energies behave as a pair in opposite ways. The two energies, in the form of mass present in the subatomic particles intrinsically built in their tiny bodies, could be the reason for the wave-particle duality behaviour. Physicists clearly assert the existence of an electrical charge and induced magnetic field in an electron. The latter is temporarily induced due to the spin of the particle. Further analysis is required to find out how the electrical charge and magnetic field inside the particle are related.

16.3.2 Light and Its Energy

The Qur'an asserts the importance of light as part of our life and its immense role in the whole universe, by providing many relevant verses that relate to it. Let us begin with the most fundamental verse that relates to the energy of light, aptly called the 'verse of light':

> Allah is the Light of the heavens and the earth. The parable of His Light is as if there were a niche and within it a lamp: the lamp enclosed in glass: the glass as it were a brilliant star: lit from a blessed tree, an olive, neither of the east nor the west, whose oil well-nigh luminous, though fire scarce touched it: Light upon Light! Allah doth guide whom He will to His Light: Allah doth set forth parable for men: and Allah doth know all things. (*An-Nur* 24:35)

Many great past Muslim scholars, including Al Ghazali (1924) and al-Suhrawardi (Marcotte 2012; Walbridge 2000), provided detailed interpretations of the verse from different perspectives, but none employed a deep knowledge of the atomic structure and subatomic particle properties in their exegeses, since these were then

relatively unknown. The verse relates the lamp to a brilliant star. Like the lamp in a house that produces light and illuminates it, the star or sun generates light to illuminate the whole solar system. But the Light of God spiritually has the power to illuminate the whole universe.

But from where did fuel to burn energy in this generation of light come? For the lamp, an oil that originally comes from an olive tree is mentioned. The oil is said to be so full of energy that a fire is produced without hardly touching it. But a clue is given by the position of the tree as being neither in the east nor the west. What does this mean? A possible explanation of the meaning can be found when the source of light is analysed. The phrase is connected to the olive tree, which is the source of fuel for the lamp. Therefore, it also contains some information about the fuel that generates light.

To delve deeper, we have to refer to the quantum world where some similarity in the functions of corresponding subatomic particles can be found. It is a well-known fact in modern physics that electrons in motion can produce light. The spinning of an electron at a high-energy level produces photons in the form of light. The phrase given in the verse may suggest the direction of a certain entity that relates to fuel energy. Since the direction is neither in the east nor the west, it could only be in the north and south direction. This is the direction of the flow of magnetic fields surrounding the earth. Therefore, the fuel or source of energy for both the sun and an electron to produce light is deemed related to the magnetic fields created around them. However, the induced magnetic field cannot be considered as the source of fuel because it is created temporarily only when the electron's electrical charge spins. Therefore, it is here believed, based on the scientific interpretation of verse (24:35), that existence of a permanent magnet is strongly predicted, not only the electrical charge, as presently understood.

Applying the Islamic science pairing concept, the two objects in a pair are created from the same source. For example, the heavens and the earth are made from smoke (21:30, 41:11) and Hawa is created out of Adam (4:1). If the permanent magnet and the electrical charge in an electron are created as a pair, as what could be implied in verse (4:40), then the two energies should originate from the same source.

16.4 Electric Unit Charge as a Source of Energy

Based on the previous analysis and findings, a new theory is developed and proposed by applying the Islamic science pairing concept and one-to-one correspondence principle. This theory endeavours to explain the fundamentals of how the three major components of an atom are formed and the energy that has been created in their formation.

The universe and everything in it are believed to have begun with an energy that is related to an electrical unit charge. At that instant not a single subatomic particle, atom or gas has yet been created. The created electrical charge is split into two equal

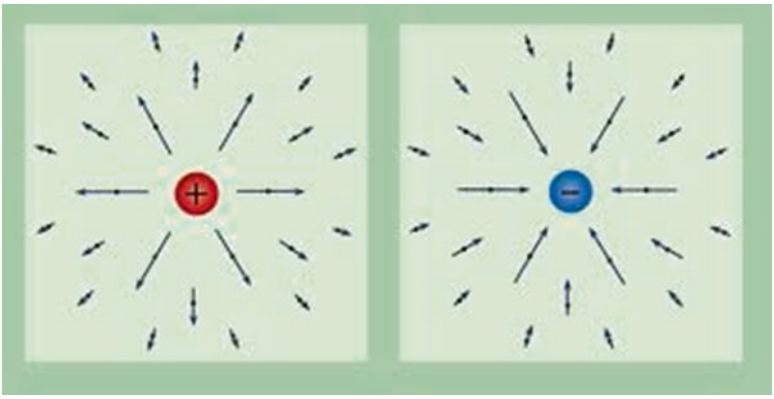

Fig. 16.1 Electric field lines for positive and negative point charges (Source: Wikipedia.com)

parts to behave oppositely as a pair because God desired everything in the universe to be created in pairs (Q. 51:49, 36:36). Based on this reason and the relevant scientific facts gathered, each of the elementary particles of an atom is postulated to consist of a pair of energies in the form of two electrical point charges, called positive and negative charges, each of the same magnitude, but acting in the opposite direction. As shown in Fig. 16.1, the energy of each point charge radiates fields in straight lines either away from the source for a positive charge or towards the source for a negative charge. From observation, when two equal charges are close together, they repel. But for two unequal charges (i.e. positive and negative), they attract.

When the positive and negative point charges are placed close together and act as a pair, the radiated fields are formed as shown in Fig. 16.2. There is a certain definite distance between them where an equilibrium is achieved. At this distance the interaction of fields as in Fig. 16.2 occurs where the two point charges do not move towards each other. Something is needed to hold the two point charges in an equilibrium position.

One way to maintain the equilibrium position of the bipolar point charges is to create a hollow sphere of diameter d and to place the bipolar charges diagonally on two opposite ends of the sphere. To accomplish this, the point charge is visualised to uniformly expand in all directions to form the surface of the sphere. In fact, recent experimental findings indicate that an electron is spherical in shape (Hudson et al. 2011). In this way, the dimensionless point charge is given three-dimensional space, and this marks the beginning of the transformation of energy that relates to a point electric charge into matter that occupies space and has mass. Based on the early Muslim scholars' Ikhwan al-Safa's theory of creation (Nasr 1978), it is here postulated that an energy transformed into three-dimensional space creates mass; therefore, the energy is equivalent to the mass of the body, as asserted by Einstein. We also assert that for subatomic particles, the basic mass is given by the energy of a unit charge created in space in the form of a hollow sphere with bipolar point charges at its top and bottom.

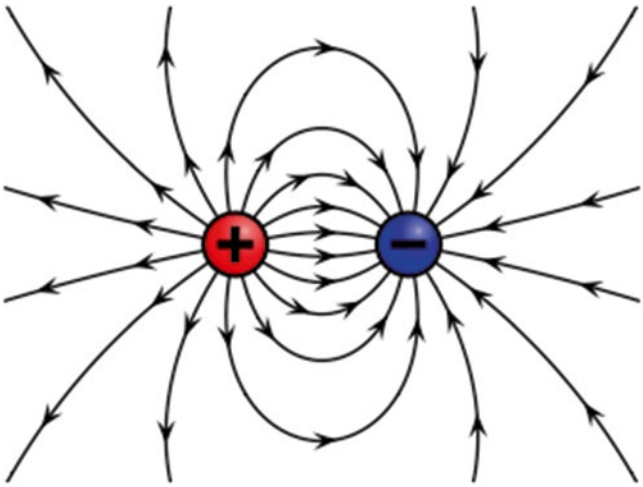

Fig. 16.2 Bipolar of positive and negative point charges (Source: Wikipedia.com)

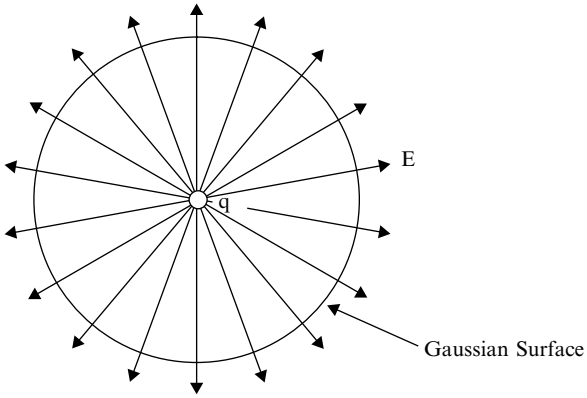

Fig. 16.3 A sphere visualised with a point charge at the centre (Source: Wolfs 2013, Chap. 24, Fig. 24.2)

The centre of the sphere can be considered as the centre of the charge. For the positive charge, the direction of the electrical field at any point on the surface is always perpendicular to the surface, as if it comes from a unit point charge in the centre of the sphere. For the negative charge, the direction of the fields is reversed and the fields are focused towards the centre. The forming of the spherical surface out of a unit charge does not alter the behaviour and properties of the charge. The electrical charge field still radiates uniformly in straight lines in all directions with a constant magnitude. The idea of forming a spherical surface with a point charge inside in a way complies with Gauss's law, as shown in Fig. 16.3.

For an electron, the unit negative charge is spread out in all directions to form a hollow sphere with a pair of positive and negative charges placed on either end across the diameter *d* of the sphere. The bipolar fields are thus automatically created surrounding the charged sphere, even if the sphere does not rotate. From Fig. 16.2,

it is shown that from observation the most concentrated and strongest fields are present at the poles where the lines are observed to be close together. As the fields move away from the source, they move on curved lines quite a distance away from each other to cover a wider area, thus reducing in strength and concentration. There is a continuous flow of fields across the surface of the charged sphere running in one direction from positive to negative points. These fields are also believed to be 'magnetic fields' flowing from the positive point, called 'north', towards the negative point, called 'south'.

In our physical world, magnetism is always found in two polarities: north and south. Even if a bar magnet is cut into two, each piece will behave like the original with north and south poles. Despite extensive searches for a magnetic monopole in the universe, it has still been unsuccessful. This indicates the probable non-existence of a magnetic charge. Only electric charges exist, and the magnetic field observed in the universe is actually the pairing action of positive and negative electric charges. The magnetic fields have actually been created out of bipolar charges.

When the same process is repeated, but with a positive point charge forming the sphere, a proton is formed. When repeated with neutral charge (positive and negative charges combined into one), a neutron is formed. Thus, three major components of an atom (electron, proton and neutron) are formed by the manipulation of positive and negative charges. Since only one distance d is possible, all spheres must be of the same diameter or size. This is the basic structure of an elementary particle in an equilibrium state, each comprising of two bipolar charges at the poles and a one charged sphere, with the exception of a neutron sphere which is made of two opposite charges.

Similar to a point charge, the sphere itself also radiates fields. For a positive sphere like a proton, the fields radiate away from the surface (see Fig. 16.3), whilst negative charges like an electron gravitate towards the centre of the sphere. Hence, an electron is comparable to the earth in creating an attractive force towards the centre of the sphere. An electron acts as a receptor, whereas a proton is like a transmitter. The energy from the nucleus of an atom could be transmitted by the proton to the electron that is continuously orbiting the nucleus, similar to the sun transmitting energy to the earth.

For the neutron, the fields of the two opposite charges cancel out each other; therefore, no fields are generated on the surface. But the energy still exists; otherwise, the sphere cannot be formed. The surface of the neutron contains more charges than the surface of the other two elements because it is comprised of two unit charges, thus doubling the value of the electron or proton. Due to the uniformity of the diameter, the energy contained in the surface of the neutron is therefore more compact as compared with the other two elements.

In this manner, only electrical unit charges present in the system. There is no other energy or forces involved in the three different systems, only two equal charges (positive and negative) with opposite directions of fields arranged in various possible combinations to act and behave differently. Structurally, the subatomic particle consists basically of two major components: a hollow sphere of electrical charge and a bipolar of point charges that produces magnetic fields, both integrated as one

system and acting as a pair in accordance with the Islamic science pairing concept. Since the magnetic fields are also created out of bipolar charges, every part of the subatomic particle is thus made of point charges, q. Ignoring the negative sign that represents the direction of the fields, the magnitude of the charges in each particle as a basic system in a state of equilibrium is as follows:

Basic charge in a system = point charge of sphere + bipolar charges:

- Charge of electron $q_e = \mathrm{q} + 2\mathrm{q} = 3\mathrm{q}$
- Charge of proton $q_p = \mathrm{q} + 2\mathrm{q} = 3\mathrm{q}$
- Charge of neutron $q_n = 2\mathrm{q} + 2\mathrm{q} = 4\mathrm{q}$

The electron is created with the intention to be in constant motion orbiting the nucleus inside an atom, so it has to be the lightest mass possible to perform the task efficiently. Therefore, an electron is equipped with the basic system equivalent to an electrical charge of 3q. But protons and neutrons are involved in the energy production at the centre of the atom with restricted movement within the nucleus. To achieve this, they should have other additional combinations of positive and negative charges to become a high-mass body with adequate energy built in. In this manner, the mass of a body represents the energy that it possesses, as asserted by Einstein. This theory postulates further by asserting that the mass of energy in matter actually consists of electrical charges.

When external energy is applied to an electron, the energy has to penetrate the magnetic fields surrounding the sphere of the electron. If able to pass through, the energy will be absorbed by the surface of the charged sphere and directed towards the centre of the sphere. The energy is thus stored inside the hollow sphere. In a free space, the applied energy could easily cause the sphere to spin in a direction perpendicular to the direction of the magnetic fields by following the right-hand rule. The relative motion between the moving charged sphere and the magnetic fields enclosing it creates the electromagnetic force within the system in a direction perpendicular to both magnetic fields and spin direction. This electromotive force causes the electron to gain speed and move faster in the orbit. Subsequently, the electron has to move to the outside orbit, which is analogous to the ‘fast lane’ of a highway system.

16.5 Additional Electric Charges for Proton and Neutron

The extra energy can be added intrinsically to the system by installing the required electrical charges inside the hollow sphere. In order to maintain the positive charge of a system, a combination of additional charges has to be provided in pairs of positive and negative charges to make it constantly neutral. If n is the total number of additional pairs put into the system, the total additional charge will be $2nq$. The arrangement is as illustrated in Fig. 16.4.

In order to maintain the balance of a system, any additional mass of charges has to be placed inside the hollow sphere. To achieve this, a cross-bracing running diagonally through the centre of the sphere must be constructed (Fig. 16.4a). For additional strength, another cross is added to give a total of two sets of crosses brac-

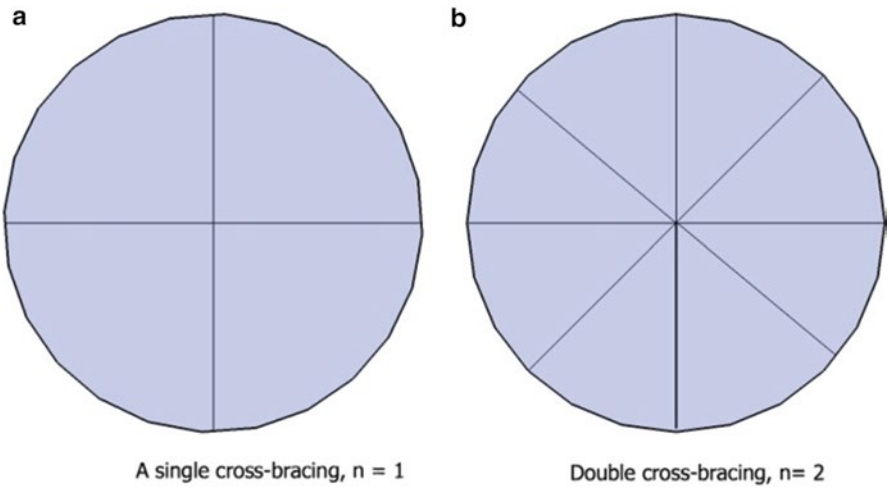

Fig. 16.4 (**a, b**) Sectional view of the cross-bracings placed inside the hollow sphere

ing in the sphere (Fig. 16.4b). The two sets of crosses will be attached to eight places on the surface of the sphere to spread evenly. This arrangement is the most suitable for balancing and evening the distribution of load inside a hollow sphere. Any additional bracings installed have to be properly located by considering the balance of the spinning sphere.

For each cross consisting of a pair of positive and negative charges, the total additional charges added into the system are 4q wherein n is 2. Since the rest mass of a body is directly related to the electric charge, the actual number of n can be easily calculated based on the relationship of the mass of the three particles. For example, the ratio of mass of the proton to that of the electron is known to be 1836; thus, the value of n of a proton can be calculated:

$$\text{Mass of proton / mass of electron} = 1836$$
$$\text{Mass of proton} = 1836 \times \text{mass of electron}$$

However, the basic mass of electron = 3q, and the mass of each cross-bracing = 2q.

Therefore, the number of cross-bracings is required, $n = 1836 \times 3q/2q = 2754$.

We can ignore the basic mass of proton = 3q which is much less with respect to the value of q for the calculated n.

16.5.1 New Potential Energy Equation

Based on the pairing concept, all energies observed in the universe are generally believed to be divisible into two types: potential energy and kinetic energy. Even though many forms of energy exist, ultimately each of them can be categorised as either potential or kinetic energy. Potential energy is intrinsic in the form of mass

and due to the position of the body at rest, whereas kinetic energy exists when the body is in motion. The kinetic energy is either converted from the potential energy of the body system or absorbed externally. The energy provided by the unit charges in the new theory can therefore be considered as the potential energy. For a body in motion, it usually has a combination of both potential and kinetic energy. In this section, the derivation of a new mathematical equation is performed.

The new proposed theory indicates the electrical charge, q, as the only source of energy of an electron. Thus, the well-established mathematical equation that represents the relationship of electrical potential energy in a system is referred. An object may have electric potential energy by virtue of two key elements: its own electric charge and its relative position to other electrically charged objects. The former is considered as appropriate in this study since we are establishing the intrinsic potential energy of an electron. The newly derived equation will relate the potential energy (PE) with the unit electric charge (q) and the mass (m) of the electron.

It is well established that an electrical potential energy, u, of a system consisting of unit charge, q, is given by

$$u = qV$$

wherein V is the potential and

$$V = q / 4\pi\varepsilon_o r$$

Therefore, for each unit charge,

$$u = q^2 / 4\pi\varepsilon_o r \tag{16.1}$$

where, for an electron, r is the radius of its sphere and ε_o is the vacuum permittivity constant.

Using speed = distance/time, where c is the speed of light and t is time,

$$c = \frac{2\pi r}{t} \quad \text{and} \quad r = \frac{ct}{2\pi}$$

Replacing r, Eq. (16.1) becomes

$$u = \frac{q^2}{4\pi\varepsilon_o}\frac{2\pi}{ct} = \frac{q^2}{2\varepsilon_o ct}$$

Therefore, potential energy

$$\text{PE} = u = \frac{q^2}{2\varepsilon_o ct} \tag{16.2}$$

Using the de Broglie equation, momentum $p = \frac{h}{\lambda}$ in which h is the Planck's constant and λ is the wavelength. Also, using $c = f\lambda$, where f is the frequency, and assuming the velocity of the electron equals the velocity of light c, we get

$$p = mc = \frac{h}{\lambda} = \frac{hf}{c} \quad \text{or} \quad f = \frac{\mathrm{m}c^2}{h}$$

Using $f = \frac{1}{t}$, we get

$$f = \frac{1}{t} = \frac{\mathrm{m}c^2}{h} \tag{16.3}$$

Substituting Eq. (16.3) into Eq. (16.2) to replace t,

$$\mathrm{PE} = \frac{q^2}{2\varepsilon_o ct} = \frac{q^2}{2\varepsilon_o c}\frac{\mathrm{m}c^2}{h} = \frac{cmq^2}{2\varepsilon_o h} = n_o mq^2$$

where $n_o = \frac{c}{2\varepsilon_o h}$ is a constant.

Therefore, we can say potential energy $\mathrm{PE} \propto mq^2$.

In the new energy equation, the existing Einstein's equation $E = mc^2$ is considered as the kinetic energy because it relates to the motion of a body that complies with Newton's second law of motion ($F = m \times a$) whereby work done = Force $F \times$ distance.

Therefore, for a system of a unit charge, total energy E = potential energy + kinetic energy:

$$E = n_o q^2 m + mc^2 = m(n_o q^2 + c^2)$$

Substituting the values to find n_o,

$$h = 6.626 \times 10^{-34}\,\mathrm{kgm^2/s}$$
$$c = 3 \times 10^8\,\mathrm{m/s}$$
$$\varepsilon_o = 8.5418 \times 10^{-12}\,\mathrm{C^2/Nm^2}$$

$$n_o = \frac{c}{2\varepsilon_o h} = 2.65 \times 10^{52}\,\mathrm{J/C^2kg}$$

where J is energy in joules and C is electric charge in coulombs.

16.5.2 Compatibility with Modern Physics

The new postulated theory is considerably radical and therefore has to be properly substantiated. Three major aspects of experimental physics are discussed and elaborated, which include the topics of zero point energy, the Stern-Gerlach experiment and lastly the issue that relates to quarks.

16.5.2.1 Zero Point Energy (ZPE)

The ZPE refers to the energy of a system at absolute zero temperature T = 0 K or the lowest quantised energy level of a quantum mechanical system. It is the energy that remains when all other energy is removed from the system (Casimir 1948). The ZPE is still a mysterious phenomenon. According to Valone (2007) nobody yet can really explain it in a real, non-hypothetical manner. However, it is clearly shown from experimental observations that what is considered as a vacuum actually contains some kind of potential energy in the form of fluctuating electromagnetic waves. Even though its presence can be detected, how much ZPE resides in a vacuum is still precisely unknown.

The mysterious ZPE can possibly be explained when it is related to the potential energy proposed in this study. Each elementary particle of an atom has electric charge and a permanent magnet intrinsically built into it. Therefore, even if at absolute zero when the electron stops spinning, the two basic energies still remain. This energy is given by the potential energy of the system, which can be clearly demonstrated by referring to the proposed energy equation:

$$\begin{aligned} \text{Total energy, E} &= \text{PE} + \text{KE} \\ &= m(n_o q^2 + c^2) \end{aligned}$$

From the above equation, even when the kinetic energy KE due to motion is zero at 0 K, the potential energy PE is still present in the system, which is detected and observed as fluctuating electromagnetic waves or what is known as ZPE. Therefore, we can say that the ZPE is actually the potential energy possessed intrinsically and permanently by the subatomic particles, irrespective of temperature. This is shown by the presence of ZPE in practically everything, including our physical bodies and measuring devices (Davies et al. 2006).

16.5.2.2 Stern-Gerlach Experiment

The Stern-Gerlach experiment performed in 1922 is a fundamental experiment in order to exhibit the quantisation of spin, thus the magnetic moment of an atom. Since the electron displays an intrinsic angular momentum, a magnetic moment occurs, which follows the form of that for an electron spin. Theoretically, the z-component of the magnetic moment associated with the electron spin would be the Bohr magneton whereby

$$\mu_Z = \pm \frac{1}{2} \mu_B \quad \text{where} \quad \mu_B = \frac{e\hbar}{2m_e}$$

where e is the electric charge, m_e is mass of the electron and $\hbar$ is Planck's constant.

But the experimentally measured value is found to be twice the predicted value (i.e. $\mu_Z = \pm\mu_B$). This means the above equation is incorrect due to the large discrepancy between the two values. Unable to find the answer why the measured value is double the predicted one, a factor g is introduced. Taking into account the factor g, the equation has consequently been rewritten as follows:

$$\mu_Z = \pm\frac{1}{2} g\mu_B$$

In physics, the constant g is called the gyromagnetic ratio or the g-factor. The electron spin g-factor has the value $g = 2.00232$ (Hyperphysics 2013).

Why is the measured magnetic field of the electron twice that of the theoretical value? To justify, the scientists introduced a factor to adjust the equation so that the theoretical and experimental values are consistent. If the experiment was correct, then it is obvious that an error was possibly made in the theoretical equation. Weinert (1995) in his paper entitled 'Wrong Theory – Right Experiment: The Significance of the Stern-Gerlach Experiments' clearly stated that the Stern-Gerlach findings posed puzzles to the theory. Even though the g value as a factor to correct the equation is derived from a well-established theory of quantum electrodynamics, there is always a great possibility that something fundamental is missing from the existing theory to fully describe the phenomenon, as emphasised by Weinert (1995). This missing entity seems so detrimental such that the introduction of a factor as a correction to the existing equation is compulsory. It is therefore anticipated that with the introduction of this missing important entity, the existing factor g is deemed unnecessary.

Based on the new proposed theory, the electron also possesses a permanent magnetic field, in addition to the induced one. Therefore, the theoretical deficiency is due to the fact that another type of magnetic field has not been accounted for in the equation; as a result, the calculated value is only half of the actual measured value. From the mathematical derivation performed based on the new proposed theory (Jaafar 2014), the values of permanent and induced magnetic fields are both the same. Thus, the theoretical equation should be double in value. This strongly asserts the possibility of the existence of another magnetic field, which has not been taken into account. Therefore, the new postulation about the existence of an intrinsic magnetic field permanently possessed by an electron is acceptable if based on the finding of the Stern-Gerlach experiment.

16.5.2.3 Quarks

Quarks are considered by physicists to be the elementary particles. They are discovered during high-energy particle collisions, but free quarks are never found in nature (Wilczek 2003, 2000; Gell-Mann 1969). Quarks are classified into three pairs: up/down (U/D), charm/strange and top/bottom. The last two pairs are very rarely found in ordinary matter and can thus be ignored.

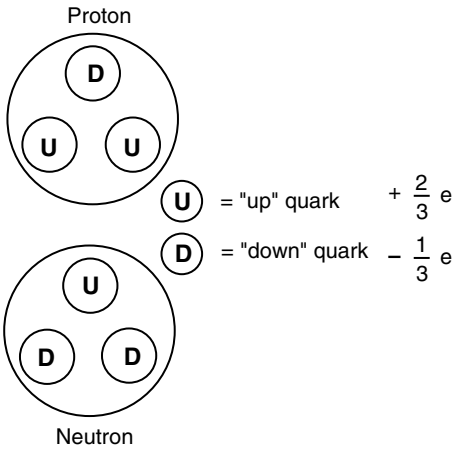

Fig. 16.5 The up and down quarks as constituents of a proton and neutron (Source: http://hyperphysics.phyastr.gsu.edu)

Unlike electrons and protons, quarks consist of electric charges in proportion of either $+2/3$ for U or $-1/3$ for D as shown in Fig. 16.5. Therefore, a proton, which is a +1 charge, would consist of UUD. Meanwhile, a neutron consists of UDD.

In accordance with the new theory, the two charges U and D found in the quark are explained to be the proportion of the charged sphere of both proton and neutron. A proton consists of one positive charge, whilst a neutron comprises one positive and one negative. When the charges of the proton and neutron are combined, the total value becomes three, consisting of two positive and one negative charges. During high-energy collisions in the laboratory, both proton and electron become fragments of charge energy that consist of the positive and negative charges in accordance to the original ratio; thus, the value of the positive charge becomes 2/3 and the negative charge becomes 1/3. Therefore, we believe in the possibility that the quark is not really the elementary particle as assumed by particle physicists, but only the fragments of the positive and negative charges contained in the nucleus. This also explains why the quark has never been discovered in nature.

16.6 Conclusion and Recommendations

The new quantum theory proposed has opened up a new frontier in the field of high-energy particle physics. It is postulated based on Islamic science principles and relevant Qur'anic verses that the elementary particles of an atom are actually made of electrical charges. The structure of each element and the stages involved in the formation of its charged sphere and associated mass are here clearly described. The new theory also proposes the existence of permanent magnetism in addition to the well-identified induced magnetic field due to its electrical charge. The wave-particle duality phenomenon of an electron is asserted due to the existence of its magnetic fields and electric fields, respectively. Also, a new mathematical equation $E=mn_o q^2$

is derived to represent the potential energy of the subatomic particles, which complements Einstein's famous equation $E=mc^2$.

This new theory could provide a better explanation of the observed phenomena at very low temperatures such as superfluidity and superconductivity. In addition, new innovative products that involve the zero point energy, particularly the micro-electromechanical/nano-electromechanical system (MEMS/NEMS), could be designed. Further research on the extraction of zero point energy (Forward 1984; Cole and Puthoff 1993; Lambrecht 2002; Dannon 2005; Moddel 2009; Munday et al. 2009) by employing the proposed equation is also encouraged. The author forsees that the advancement in this field will create another technological revolution that completely changes the way we live.

Based on these findings, scientific research in the following areas is highly recommended:

- Quantum biology is considered a new field of knowledge, which has been aggressively explored by physicists in the past decade (Engel et al. 2007; Ball 2011; Lipton 2011). By applying the Islamic science principles, coupled with some of the findings proposed here, a new approach is highly recommended for the in-depth study of quantum biology.
- Quantum computer – The newly proposed detail structure of the three elements of an atom and the energy that they possess could be useful in providing the necessary solid foundation for the conceptual design of a quantum computer, which could, for example, solve the 'decoherence' problem.[1]

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[1] The quantum computer is extremely sensitive to its surroundings, the interaction with which could lead to collapse of the state function, also called 'decoherence', resulting in computational errors.

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